



## Short report

## Blood alcohol levels in suicide by hanging cases in the state of Sao Paulo, Brazil

Talita Zerbiní MD, Forensic Examiner, Post Graduating of Legal Medicine <sup>a,b,\*</sup>, Julio de Carvalho Ponce MD, Post Graduating of Legal Medicine <sup>b</sup>, Daniele Mayumi Sinagawa MD, Post Graduating of Legal Medicine <sup>b</sup>, Raquel Barbosa Cintra MD, Forensic Examiner, Post Graduating of Legal Medicine <sup>a,b</sup>, Daniel Romero Muñoz PhD, Professor <sup>b</sup>, Vilma Leyton PhD, Professor <sup>b</sup>

<sup>a</sup> Medical Legal Institute, Sao Paulo, Brazil

<sup>b</sup> Department of Legal Medicine, Faculty of Medicine of Sao Paulo University, Sao Paulo, Brazil

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## ABSTRACT

Suicide is one of the main causes of violent death worldwide, and has become a public health issue. Since alcohol consumption is associated with the increase in the number of suicides and hanging is one of the main methods used worldwide, the present study consists of an epidemiological analysis of BACs in victims of suicide by hanging autopsied in the State of Sao Paulo, Brazil. The objective of the present work was to establish an epidemiological profile and evaluate blood alcohol concentrations in victims of suicide by hanging in the State of São Paulo, Brazil, in the year of 2007. A cross-sectional retrospective study was conducted by collection of secondary data from autopsy reports of victims of hanging. According to the present study, positive results for alcohol were higher in male victims, but the mean BAC was higher in women.

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## 1. Introduction

Suicide is one of the main causes of violent death, and it has become a public health issue.<sup>1</sup> In 2000, the worldwide rate for this type of death was 14.5/100,000 people.<sup>2</sup> Suicide was responsible for 20–25% of violent deaths in Sweden,<sup>3</sup> and was the 11th most common cause of the death in the United States, with 30,000 deaths in 2001. Recently, there has been an increase in the number of suicide cases among young men, especially in developed countries.<sup>4</sup> For example, suicide rates in Brazil increased by 21% between 1980 and 2000 for men in this age group (aged 15–24).<sup>5</sup>

Hanging is the most common method for suicide in countries such as Germany and Japan, and the second most common in India and the United States.<sup>6</sup> It is also the method of choice among young men in most countries<sup>4</sup>; for example, it is six times more frequent in men than in women in the same age range in Australia.<sup>7</sup> The mean age for suicide by hanging for men was 19.5 years, with about 7% of the cases under 16.<sup>8</sup>

The approach to understanding suicide must be multidisciplinary, involving psychologists, psychiatrists, toxicologists, physiologists and physicians, because suicide is a multi-faceted and complex event. The premature and violent death of the victims has negative repercussions in society and should be prevented whenever possible.

Regarding the relationship between social issues and suicides, it is reported that the early onset of alcohol consumption, initiation of sexual life before 13 years of age, the use of injectable drugs and rape are associated with high rates of suicide in both sexes.<sup>9</sup> However, depression and alcoholism are responsible for 44 and 23%, respectively.<sup>10</sup>

A previous study examined the association between alcohol use and suicide in 13 countries (Eastern Germany, Belgium, Canada, Denmark, USA, Finland, the Netherlands, Luxembourg, Norway, New Zealand, Sweden, Switzerland and Czechoslovakia), and an association was established in all but three (Denmark, Luxembourg and New Zealand).<sup>11</sup> Although alcohol consumption rates in Portugal are among the highest in the world, the suicide rates are extremely low, probably due to cultural factors. The strongest relationship between alcohol consumption and suicide was observed in Sweden.<sup>12</sup> In this country, students who ingest alcoholic beverages were 31% more likely to commit suicide than those

\* Corresponding author. 455 Doutor Arnaldo Avenue, Oscar Freire Institute, São Paulo 01246-903, Brazil. Tel.: +55 11 87525482; fax: +55 11 30610552.

E-mail address: [tazerbini@yahoo.com.br](mailto:tazerbini@yahoo.com.br) (T. Zerbiní).

who do not drink.<sup>10</sup> In Germany, 17% of suicide attempts were related to alcohol use, and 32% of the attempts occurred after acute alcohol consumption. Older men with previous suicide attempts are especially likely to use alcohol in subsequent attempts.<sup>13</sup> It has also been reported that alcoholism is more prevalent in young male suicide victims than in older males, being present in up to 56% of suicide cases in Finland and in 37% of teenage victims in Sweden.<sup>14</sup> In contrast, a positive blood alcohol content (BAC) was found in only 6.76% of cases in Saudi Arabia.<sup>15</sup>

The prevalence of alcohol use among suicide victims in the State of New Mexico, USA, was 44.3%. The mean BAC of these victims was  $1.98 \pm 0.88$  g/L.<sup>16</sup> In a study carried out in Turkey, a positive BAC was observed in 12% of victims of suicidal hanging. In this study, the highest BAC level observed was 4.21 g/L in a chronic alcoholic and the lowest was 0.30 g/L.<sup>17</sup>

The mean BAC for suicide victims in Sweden was  $1.32 \pm 0.89$  g/L, and the highest was 6.6 g/L. Alcohol was found in the blood of 36% of men (mean = 1.3 g/L) and 31% of women (mean = 1.1 g/L). Of the suicide victims in this study, 34% had ingested alcohol before killing themselves. The proportion of men and women positive for BAC was 74:26. Alcohol was not associated with any specific mode of suicide.<sup>3</sup>

In the State of Sao Paulo, Brazil, in 2005, the mean BAC was 1.52 g/L for male suicide victims and 1.38 g/L for female suicide victims. In that study, 31.8% of the suicides were by hanging, which was the method chosen by the majority of the male victims. A positive BAC was observed in 39.8% of victims of suicide by hanging.<sup>18</sup>

According to data from the Center for Disease Control and Prevention in the USA, 24% of suicide victims had a BAC over 0.8 g/L. In a Swedish study, it was established that BACs over 0.4 g/L are probably a result of alcohol consumption before death and not as a result of post-mortem ethanol synthesis.<sup>3</sup>

Because alcohol consumption is associated with increased numbers of suicides and because hanging is one of the main methods for suicide used worldwide, the present study consists of an epidemiological analysis of BACs in victims of suicide by hanging autopsied in the State of Sao Paulo, Brazil. The aim of this study was to establish a profile of the group with the greatest suicidal tendencies.

## 2. Objective

Our objective was to establish an epidemiological profile and evaluate blood alcohol concentrations in victims of suicide by hanging in the State of Sao Paulo, Brazil, in 2007.

## 3. Method

A cross-sectional retrospective study was conducted by collection of secondary data from autopsy reports of victims of suicide by hanging. The cause of death for all subjects was determined by coroners at the Medico-Legal Institute of the State of Sao Paulo between January and December of 2007.

Demographic characteristics (such as age and gender) were obtained from the medical examiners' reports and linked to the BAC values.

The blood samples were analyzed by headspace gas chromatography, with a value of  $>0.2$  g/L used as the criterion for a positive result.

## 4. Results

This study examined 184 cases of victims of suicide by hanging in 2007. These cases represented 10.7% of the suicides that occurred

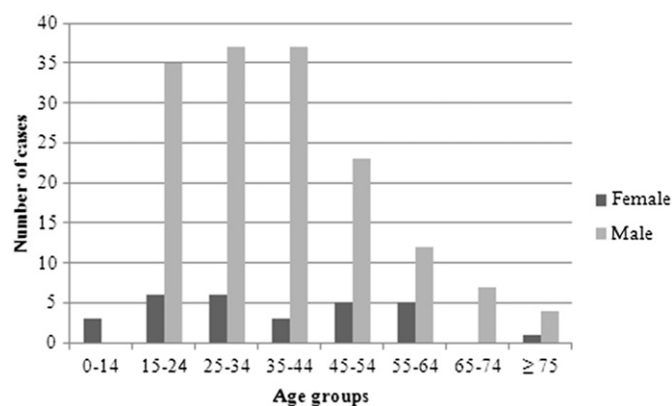


Fig. 1. Age and gender of 184 victims of suicide by hanging in state of Sao Paulo, Brazil.

in that period of time. The age range was 4–86 years, with mean ages of 37.3 for the females, 38.2 for males and 38 years for the two genders combined.

The victims were predominantly male (84.2%), and young people were the most affected age bracket: 67.4% of cases had ages between 15 and 44 for both genders (Fig. 1).

A positive BAC was found in 37.5% of the victims. Of the female hanging victims, 17.2% were positive for BAC, while 41.3% of the males were positive. In both genders, young adults had the highest incidence of positive BAC, as shown in Fig. 2.

The mean BAC for all positive cases was  $1.80 \pm 0.90$  g/L. The mean BAC was similar for females and males ( $1.84 \pm 0.92$  g/L for females;  $1.80 \pm 0.90$  g/L for males). The data are shown in Fig. 3.

## 5. Discussion

Hanging is a common method of suicide in many countries, and it is the method used by 70% of men who commit suicide indoors.<sup>10</sup>

In the western world, around 90% of people consume alcoholic beverage at some point in their lives, and 40% develop temporary or lasting alcohol-related problems,<sup>19</sup> as defined in the DSM (Diagnostic and Statistical Manual) and ICD (International Classification of Diseases).<sup>10</sup>

The mean age of the victims of the present study was 38 years, which is twice the mean age of the victims in a study conducted in India.<sup>1</sup>

With respect to the age and gender of the victims, young males outnumbered all other groups by a factor of 5.25:1.<sup>4,7,8</sup>

In the present study, we observed a positive BAC in over one third of victims of suicide by hanging, i.e., they were under the

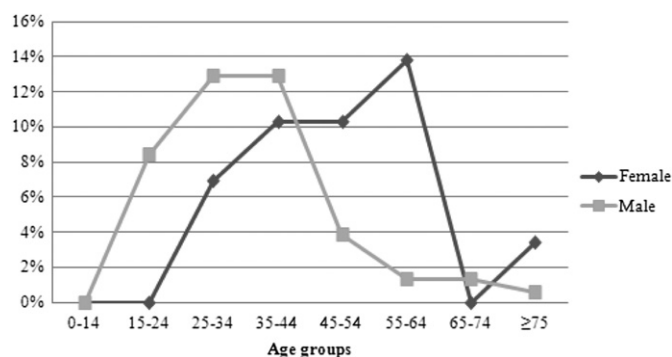


Fig. 2. Percentage of cases where alcohol was detected in 184 victims of suicide by hanging in state of Sao Paulo, Brazil, according to age and gender.

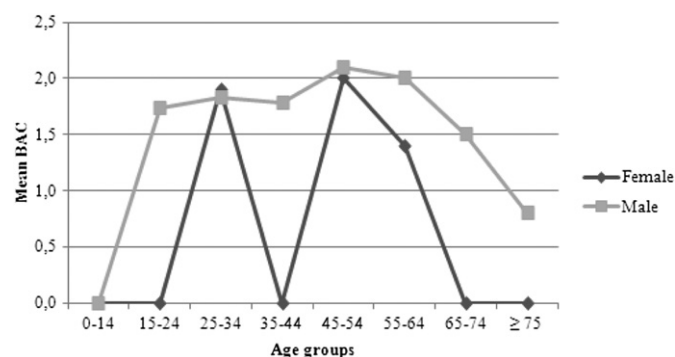


Fig. 3. Mean BAC of all positive cases in 184 victims of suicide by hanging in state of Sao Paulo, Brazil, according to age and gender.

influence of acute alcohol ingestion when committing suicide. These data are comparable to the rate found in studies in Sao Paulo, Brazil, for suicides in general<sup>18</sup> and in Australia, where alcohol was detected in 38% of the autopsies of suicide victims.<sup>8</sup> These frequencies are approximately two to five times higher than the observed incidence of alcohol intoxication in suicide victims in Turkey and Saudi Arabia. These differences may be explained by the culture, including the severe laws related to sales and consumption of alcohol in those countries.<sup>15,17</sup>

A separate analysis by gender indicated that the mean BAC for the males was slightly higher than for the females, similar to the results of previous studies.<sup>3</sup> It is also noteworthy that although the average BAC was similar in male and female suicide victims, the frequency of positive BAC was greater in the males than in the females. This suggests that more males consume alcohol before committing suicide, but the females who do consume alcohol may consume larger volumes. As previously mentioned, alcoholics are a high risk group for suicide, especially for younger males.<sup>13,14</sup> In Brazil, the fourth largest beer producer of the world, it is estimated that young males are the largest group of alcohol consumers.<sup>18</sup> In general, males seem to commit alcohol-influenced suicide at an earlier age (Fig. 2).

Alcohol causes attention deficit, diminished cognition, autobiographical memory and disinhibition, in addition to dysphoria, depression and aggressiveness,<sup>20</sup> impulsiveness and self-destructive behavior.<sup>10</sup>

The high mean BAC found in the present study (1.80 g/L) is consistent with self-destructive behavior associated with impulsiveness, which can lead to suicide, especially among males. The authors did not have the opportunity to assess whether the victims had psychiatric disorders because that information is not usually disclosed in police reports. However, psychiatric disorders are twice as frequent in people who consume alcohol as in people who do not drink.<sup>14</sup> The observations of the present study as well as those of previous reports suggest that alcohol dependence increases the risk for suicide. It is therefore essential that possibly alcoholics should be seen as a target group for preventive measures, and screening for alcohol disorders should be routinely done in psychiatric clinics, as suggested in previous study.<sup>13</sup>

## 6. Conclusion

This study indicates that the frequency of positive BAC was slightly higher for male suicide victims, whereas the mean BAC was equal in male and female suicide victims with positive BACs.

The high rate of positive results for the consumption of ethanol suggests that it is a risk factor associated with suicide. Thus, preventive measures should be developed and improved for this risk group.

## Conflict of interest

None.

## Ethics

The study was approved by the Ethics Committee for Analysis of Research Projects (CAPPesq) of the Clinics Hospital of the School of Medicine, University of Sao Paulo.

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## Appendix. Supplementary data

Supplementary data related to this article can be found online at doi:10.1016/j.jflm.2012.02.022.

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